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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/882,515	06/15/2001	Stefan Uhlenbrock	6047-59237	1148

7590

09/20/2004

KLARQUIST SPARKMAN CAMPBELL  
LEIGH & WHINSTON, LLP  
One World Trade Center, Suite 1600  
121 S.W. Salmon Street  
Portland, OR 97204

EXAMINER
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ALEJANDRO MULERO, LUZ L

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 09/20/2004

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 09/882,515  
Filing Date: June 15, 2001  
Appellant(s): UHLENBROCK, STEFAN

**MAILED**  
SEP 16 2004  
**GROUP 1700**

\_\_\_\_\_  
Wayne W. Rupert  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 6/30/04.

**(1) *Real Party in Interest***

A statement identifying the real party in interest is contained in the brief.

**(2) *Related Appeals and Interferences***

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

**(3) *Status of Claims***

The statement of the status of the claims contained in the brief is correct.

**(4) *Status of Amendments After Final***

No amendment after final has been filed.

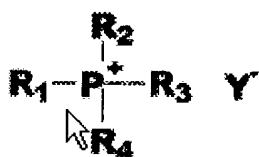
**(5) *Summary of Invention***

The summary of invention contained in the brief is substantially correct.

The instant claimed invention is directed to an apparatus for vaporizing and transporting precursor molecules to a deposition chamber for deposition of a thin film on a substrate, the apparatus comprising: an ionic liquid source; a carrier gas source in fluid communication with the ionic liquid source; and a deposition chamber in fluid communication with the carrier gas source, as required by claim 31.

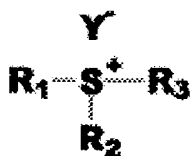
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Furthermore, the instant claimed invention is directed to an apparatus for vaporizing and transporting precursor molecules to a deposition chamber for deposition of a thin film on a substrate, the apparatus comprising: an ionic liquid source; a carrier gas source in fluid communication with the ionic liquid source; and a deposition chamber in fluid communication with the carrier gas source; wherein the ionic liquid satisfies the formula:



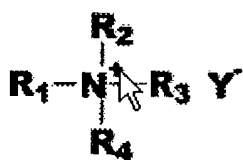
wherein R<sub>1</sub>, R<sub>2</sub>, and R<sub>3</sub> are alkyls and Y<sup>-</sup> is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, [SbF<sub>6</sub>]<sup>-</sup>, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof, as required by claim 47.

Additionally, the instant claimed invention is directed to an apparatus for vaporizing and transporting precursor molecules to a deposition chamber for deposition of a thin film on a substrate, the apparatus comprising: an ionic liquid source; a carrier gas source in fluid communication with the ionic liquid source; and a deposition chamber in fluid communication with the carrier gas source; wherein the ionic liquid satisfies the formula:



wherein  $\text{R}_1$ ,  $\text{R}_2$ , and  $\text{R}_3$  are alkyls and  $\text{Y}^-$  is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates,  $[\text{SbF}_6]^-$ , chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof, as required by claim 48.

Also, the instant claimed invention is directed to an apparatus for vaporizing and transporting precursor molecules to a deposition chamber for deposition of a thin film on a substrate, the apparatus comprising: an ionic liquid source; a carrier gas source in fluid communication with the ionic liquid source; and a deposition chamber in fluid communication with the carrier gas source; wherein the ionic liquid satisfies the formula:



wherein  $\text{R}_1$ ,  $\text{R}_2$ ,  $\text{R}_3$ ,  $\text{R}_4$  are alkyls and  $\text{Y}^-$  is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates,  $[\text{SbF}_6]^-$ , chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof, as required by claim 50.

Furthermore, the instant claimed invention is directed to an apparatus for vaporizing and transporting precursor molecules to a deposition chamber for deposition of a thin film on a substrate, the apparatus comprising: an ionic liquid source; a carrier gas source in fluid communication with the ionic liquid source; a deposition chamber in fluid communication with the carrier gas source; and a first vessel containing a first precursor and a second vessel containing a second precursor, each first and second vessel in fluid communication with the ionic liquid source, the carrier gas source, and the deposition chamber, as required by claim 57.

**(6) *Issues***

The appellant's statement of the issues in the brief is correct.

**(7) *Grouping of Claims***

Appellant's brief includes a statement that claims 31-32, 45-46 and 51-52 stand or fall together.

Appellant's brief includes a statement that claims 47 and 53 stand or fall together.

Appellant's brief includes a statement that claims 48 and 54 stand or fall together.

Appellant's brief includes a statement that claims 50 and 56 stand or fall together.

Appellant's brief includes a statement that claims 57 stand on its own.

**(8) Claims Appealed**

Claims 45-46, 48, 50, 53-54, and 56 contain(s) substantial errors as presented in the Appendix to the brief. Accordingly, claims 45-46, 48, 50, 53-54, and 56 have been correctly written in the Appendix to the Examiner's Answer.

**(9) Prior Art of Record**

5,188,914	Blomgren et al.	2-1993
4,911,101	Ballingall, III et al.	3-1990
4,839,249	Jones et al.	6-1989
WO 95/21872	Abdul-Sada et al.	8-1995

Freemantle, Michael "Designer Solvents Ionic liquids may boost clean technology development" C&EN London, (march 30, 1998), pp 32-37

**(10) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 31-32, 45-46, and 51-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted prior art in view of Freemantle (C&EN).

Applicant admits on page 8, line 24 of the specification that Fig. 1 shows a conventional apparatus. The conventional apparatus consists of an apparatus capable of vaporizing and transporting precursor molecules to a chamber capable of depositing a thin film on a substrate, the apparatus comprising: a vessel 42 capable of containing an ionic liquid; a carrier gas source 44 in fluid communication with the vessel 42; a bubbler device capable of bubbling a carrier gas through the vessel; a chamber 10 capable of deposition in fluid communication with the carrier gas source 44; and a gas line 45 capable of transporting carrier gas and vaporized precursor molecules from the vessel to the deposition chamber (see page 10-line 22 of specification to page 11-line 21).

Admitted prior art fails to expressly disclose an ionic liquid source, specifically, an ionic liquid source as recited in claims 45-46 and 51-52. Freemantle discloses the use of ionic liquids in a variety of applications and also discloses wide ranging advantages of ionic liquids such as high thermal and chemical stability, large liquid temperature range, and no vapor pressure, for instance (see pages 32-33). Specifically, Freemantle also discloses the ionic liquid sources of claims 45-46 and 51-52 (see the figure at bottom of page 32). In view of this disclosure, it would have been obvious to one of ordinary skill at the time the invention was made to modify the apparatus of the Admitted prior art so as to include an ionic liquid source in the precursor vessel because ionic liquids have the advantage of being nonvolatile, with no vapor pressure, a large liquid temperature range, and high chemical and thermal stability.



Claims 47 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted prior art in view of Freemantle (C&EN) as applied to claims 31-32, 45-46, and 51-52 above, and further in view of Blomgren et al., U.S. Patent 5,188,914.

Admitted prior art and Freemantle are applied as above but fail to expressly disclose the specific ionic liquid of claims 47 and 53. Blomgren et al. discloses the ionic liquid of claims 47 and 53 (see col. 2-line 49 to col. 3-line 5). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of the Admitted prior art modified by Freemantle so as to include the ionic liquid of Blomgren et al. depending upon the desired properties of the ionic liquid precursor and/or the particular process being conducted in the apparatus.

Claims 48 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted prior art in view of Freemantle (C&EN) as applied to claims 31-32, 45-46, and 51-52 above, and further in view of Jones et al., U.S. Patent 4,839,249.

Admitted prior art and Freemantle are applied as above but fail to expressly disclose the specific ionic liquid of claims 48 and 54. Jones et al. discloses the ionic liquid of claims 48 and 54 (see col. 2-lines 45-55). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of the Admitted prior art modified by Freemantle so as to include the ionic liquid of Jones et al. depending upon the desired properties of the ionic liquid precursor and/or the particular process being conducted in the apparatus.

Claims 50 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted prior art in view of Freemantle (C&EN) as applied to claims 31-32, 45-46, and 51-52 above, and further in view of Abdul-Sada et al., WO 95/21872.

Admitted prior art and Freemantle are applied as above but fail to expressly disclose the specific ionic liquid of claims 48 and 54. Abdul-Sada et al. discloses the ionic liquid of claims 50 and 56 (see abstract). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of the Admitted prior art modified by Freemantle so as to include the ionic liquid of Abdul-Sada et al. depending upon the desired properties of the ionic liquid precursor and/or the particular process being conducted in the apparatus.

Claim 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted prior art in view of Freemantle (C&EN) as applied to claims 31-32, 45-46, and 51-52 above, and further in view of Ballingall, III et al., U.S. Patent 4,911,101.

Admitted prior art and Freemantle are applied as above but fail to expressly disclose a second vessel containing a second precursor in fluid communication with the chamber. Ballingall, III et al. discloses a first vessel 15 containing a first precursor and second vessel 35 containing a second precursor in fluid communication with the reaction chamber (see fig. 3 and col. 9-line 52 to col. 10-line 7). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of the Admitted prior art modified by

Freemantle so as to further comprise a second vessel containing a second precursor in fluid communication with the chamber as disclosed by Ballingall, III et al., because this would allow for the introduction of a first and a second precursor into the reaction chamber.

**(11) Response to Argument**

Appellant's arguments filed 6/30/04 have been fully considered but are not persuasive.

Appellant argues there is no motivation to combine the admitted prior art and Freemantle references because there is no suggestion from Freemantle to use ionic liquid sources in an apparatus such as the one shown in figure 1 of the Admitted prior art. However, the examiner respectfully disagrees because Freemantle discloses the benefits of ionic liquid sources as disclosed in the above rejection under 35 USC 103 which would suggest to one of ordinary skill in the art to use the ionic liquid sources disclosed by Freemantle in an apparatus such as the one shown in figure 1 of the Admitted prior art. Therefore, the references suggest the desirability and thus the motivation of making the combination under 35 USC 103 and the rejection is supported.

Moreover, concerning the fact that the reference of the admitted prior art fails to suggest an ionic liquid source and Freemantle fails to mention a CVD apparatus or process, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413,

208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Regarding the fact pointed out by appellant that Freemantle discloses a multitude of uses for ionic liquids, this fact does little to alter the fact that the advantages of ionic liquids disclosed by Freemantle establishes a prima facie case of obviousness when combined with the primary reference of the admitted prior art.

Regarding the assertion that using the advantages of ionic liquids disclosed by Freemantle to combine this reference with the primary reference of the admitted prior art is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Concerning appellant's argument that no reasonable expectation of success has been shown, the examiner respectfully submits that the advantages of ionic liquids disclosed by Freemantle is sufficient to establish a reasonable expectation of success. Moreover, appellant has not furnished any evidence to suggest that there is not a reasonable expectation of success. Furthermore, the portion of Freemantle which states that the use of ionic liquids is "highly speculative" appears to refer more to the

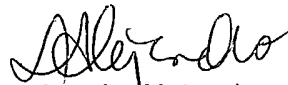
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growing number of different potential applications that ionic liquids can be used than it does to the ability of ionic liquids to perform in a given application.

Regarding the rejections of the dependent claims using the Blomgren, Jones, Abdul-Sada, and Ballingall references, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

For the above reasons, it is believed that the rejections should be sustained.



Respectfully submitted,



Luz L. Alejandro  
Primary Examiner  
Art Unit 1763

September 13, 2004

Conferees

KLARQUIST SPARKMAN CAMPBELL  
LEIGH & WHINSTON, LLP  
One World Trade Center, Suite 1600  
121 S.W. Salmon Street  
Portland, OR 97204

  
W. L. WALKER  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700

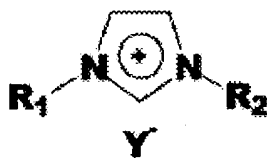
APPENDIX  
(Listing of the corrected claims)

Claim 45: The apparatus of claim 31, wherein the ionic liquid is of the formula:



wherein  $R_1$  is alkyl and  $Y^-$  is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates,  $[SbF_6]^-$ , chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof.

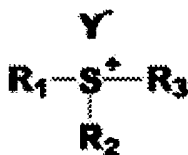
Claim 46: The apparatus of claim 31, wherein the ionic liquid is of the formula:



wherein  $R_1$  and  $R_2$  are alkyls and  $Y^-$  is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates,  $[SbF_6]^-$ , chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof.

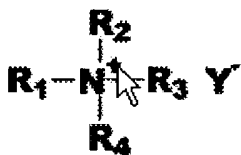
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Claim 48: The apparatus of claim 31, wherein the ionic liquid satisfies the formula:



wherein R<sub>1</sub>, R<sub>2</sub>, and R<sub>3</sub> are alkyls and Y<sup>-</sup> is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, [SbF<sub>6</sub>]<sup>-</sup>, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof.

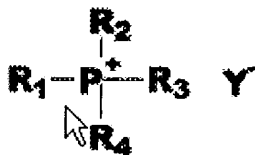
Claim 50: The apparatus of claim 31, wherein the ionic liquid satisfies the formula:



wherein R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub> are alkyls and Y<sup>-</sup> is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, [SbF<sub>6</sub>]<sup>-</sup>, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof.

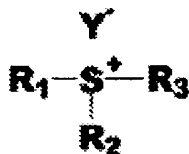
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Claim 53: The system of claim 32, wherein the ionic liquid satisfies the formula:



wherein R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub> are alkyls and Y<sup>-</sup> is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, [SbF<sub>6</sub>]<sup>-</sup>, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof.

Claim 54: The system of claim 32, wherein the ionic liquid satisfies the formula:

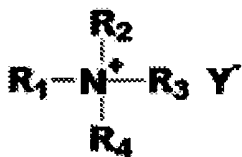


wherein R<sub>1</sub>, R<sub>2</sub>, and R<sub>3</sub> are alkyls and Y<sup>-</sup> is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, [SbF<sub>6</sub>]<sup>-</sup>, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof.



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Claim 56: The system of claim 32, wherein the ionic liquid satisfies the formula:



wherein R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub> are alkyls and Y<sup>-</sup> is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, [SbF<sub>6</sub>]<sup>-</sup>, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof.